OCCURRENCE OF *TRIOZOCERA MEXICANA* PIERCE (STREPSIPTERA: CORIOXENIDAE) IN OKLAHOMA, WITH A BRIEF REVIEW OF THIS GENUS AND SPECIES

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Abstract

This species is recorded from light trap collections in Norman, Cleveland County, Oklahoma, with a peak abundance in July and August. Notes on surface structure as shown with SEM are given.

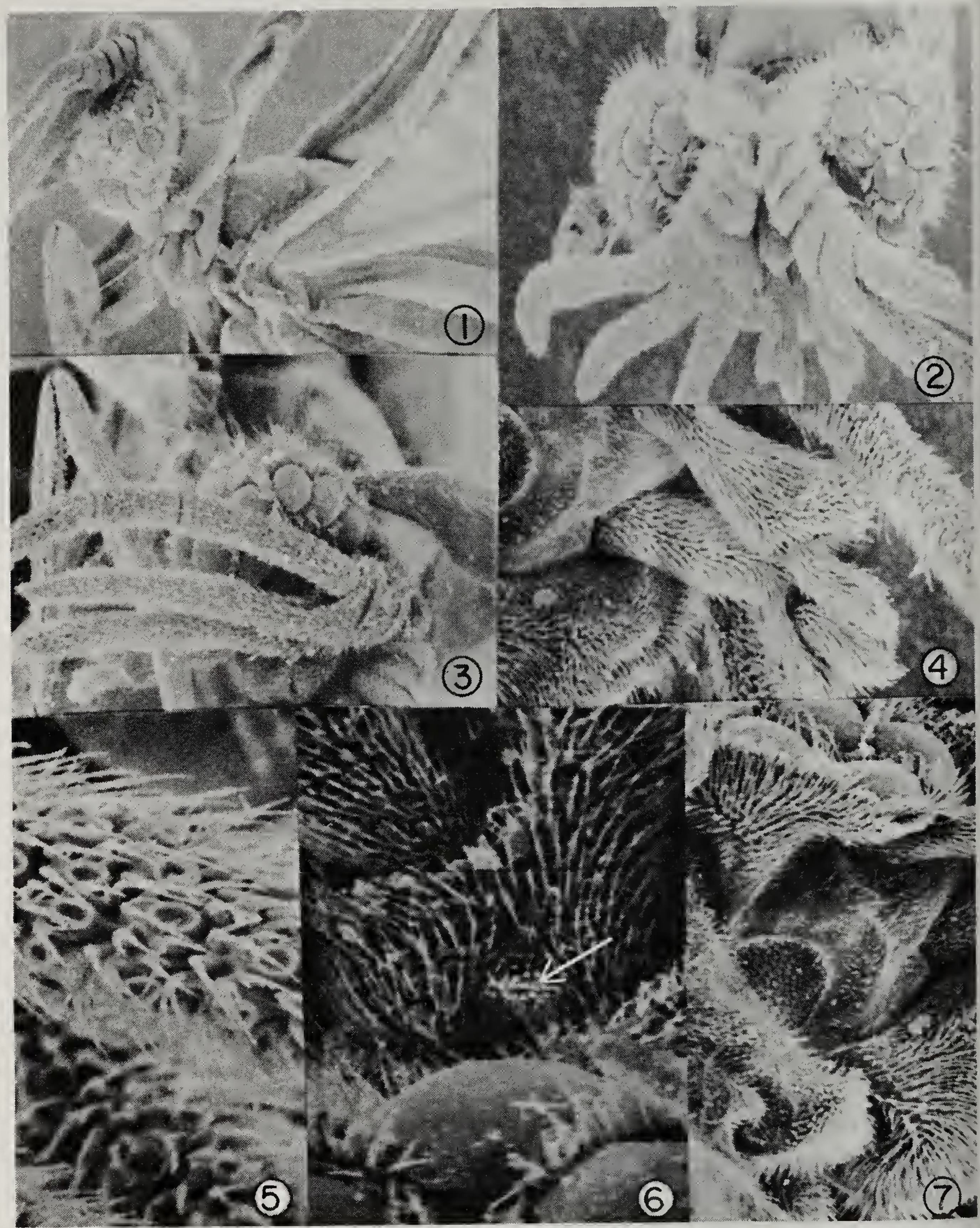
Systematics

Triozocera mexicana was described by W. Dwight Pierce (1909) from two specimens collected at Cordoba, Vera Cruz, Mexico. He placed the new species in the family Mengeidae, the most primitive group of strepsipterans. Pierce (1911) added another species to the genus, *T. texana.* This second species was represented by a single specimen taken at Victoria, Texas. Some confusion in distinguishing the two species apparently existed as Pierce used different sets of characters to separate them in subsequent papers. After examination of the types, Richard Bohart (1940) decided that the differences noted by Pierce were artifacts produced during mounting and that there was only a single species. He declared *T. texana* the junior synonym. Even Pierce (1918) mentioned that some of the specimens were mounted in a way that made accurate illustrations difficult. This confusion was undoubtedly a result of the small number of specimens (3) available to Pierce for study. Bohart also placed the genus in Mengeidae but noted that *Triozocera* was distinct from the other three genera then in the family. Also, he thought the East African *Corioxenos* to be closely related but could not reconcile differences in antennae and tarsi. Most American entomological texts continue to present this classification.

Esaki and Miyamoto (1958) suggested that *Triozocera* and *Corioxenos* formed a natural group and that *Callipharixenos* and *Chrysocorixenos* would have close affinities when better known. These 4 genera were placed in the family Callipharixenidae. Later, Carvalho (1961) grouped *Triozocera* with *Corioxenos, Dundoxenos* and *Callipharixenos* as the subfamily Callipharixeninae of the family Mengeidae, based on the presence of lateral tarsal sensillae and reduction of the fifth tarsal segment. In the latest move, E. F. Riek (1970) erected the new family Corioxenidae for *Triozocera* and *Corioxenos.*

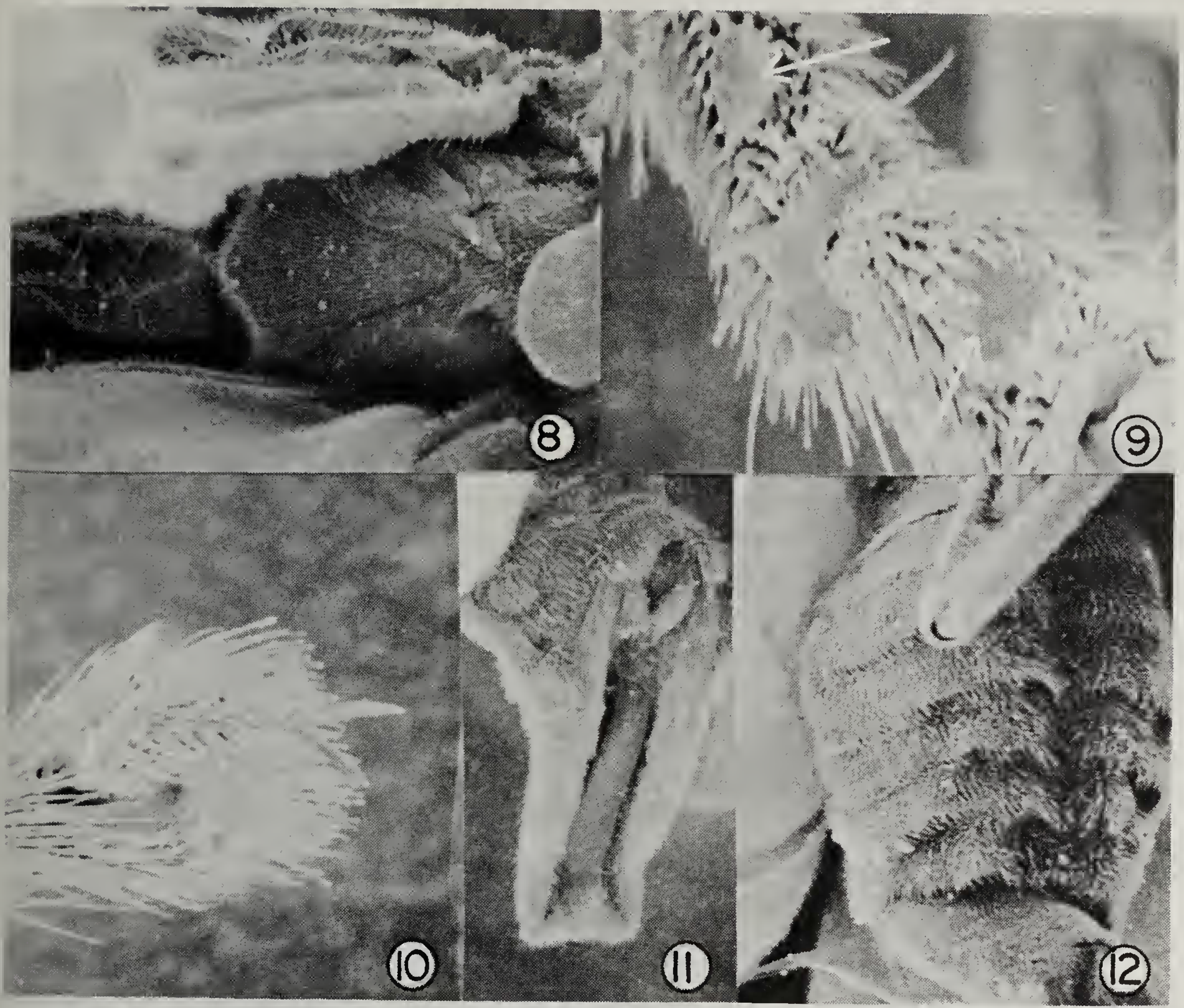
Morphology

The structure of several Oklahoma specimens has been examined with scanning electron microscopy and standard light microscopy. Notes on the general structure are offered here in an abbreviated form to complement previous descriptions. Microtrichia cover the general body surface, giving a



Figs. 1-7, *Triozocera mexicana*: 1, Head and thorax; 2, Head; 3, Antennae; 4, Maxillary palpi; 5, Antennal surface; 6, Fourth antennal sensillum; 7, Oral area.

fuzzy appearance (Figs. 2, 7, 8 and 12). The mesothorax is arched with the elytra held upright (Fig. 1). The unstalked, comparatively large eyes have 15 ommatidia (Figs. 1 and 2). Khalaf (1968) counts 16 ommatidia in Louisiana specimens arranged in 2 concentric circles around 1 central ommatidium. Fifteen ommatidia are found in the eye of *T. paulistana* (Kogan 1958) and 20-21 in that of *T. macroscyti* (Esaki and Miyamoto 1958). Although the eye is not described for *T. maxi,* illustrations show 17 ommatidia on the dorsal half of each eye (Fox and Fox 1964). This would indicate a far



Figs. 8-12, *Triozocera mexicana*: 8, Mesothorax; 9, Second and third tarsal sensillae; 10, Fourth and fifth tarsomeres; 11, Aedeagus in closed position; 12, Abdominal sternites and extended aedeagus.

greater number for the whole eye than in other species of *Triozocera*. In contrast, Kritsky *et al.* (1977) count 40-50 ommatidia per eye in *Xenos peckii* and Wachmann (1972) illustrates even more for *Stylops* sp. The microtrichia surrounding the ommatidia in *T. mexicana* project out further than in most strepsipterans. Branched and unbranched microtrichia and rounded sensory structures cover the antennal surface (Figs. 1-6). These sensory structures appear apically concave in scanning micrographs, but Brandenburg and Matuschka (1976) have shown them to be apically domed. Recent works (Brandenburg and Matuschka 1976; Slifer 1977) with species of *Stylops* have demonstrated histologically that these are chemoreceptors related to sensilla placodea. The large, round sensillum at the base of the fourth antennal segment, as described by Bohart (1940) and Riek (1970), is located on the anterior surface near the eyes (Fig. 6). It is a group of blunt pegs and similar to a pit peg organ, a form of long distance chemoreceptor. Of the mouthparts, only the maxillary palpi remain (Figs. 2 and 4). They are 2-segmented with the first lobed apically and almost surpassing the second. Khalaf (1968) notes that they are darker than the antennae. Esaki and Miyamoto (1958) and Fox and Fox (1964) interpret these structures as the maxillae plus 1-segmented palpi. The oral area is covered with scales (Fig. 7). Campaniform receptors were found on the basal sclerites of the wings but

not on the elytra. However, Askew (1971) reports that they are found on the elytra in other species. The fore and middle coxae are elongate and subequal to the femur. The forelegs resemble those of mantids and perhaps are used to retain position on the female's host during copulation. All tarsi are pentamerous with the fourth tarsomere lobed and extending well beyond the base of the fifth (Fig. 10). Riek (1970) maintains that the fourth is the last functional tarsomere in this genus although the fifth appears of sufficient size to be functional in Oklahoma specimens. Illustrations of *T. paulistana* (Kogan 1958), *T. maxi* (Fox and Fox 1964) and *T. macroscyti* (Esaki and Miyamoto 1958) also indicate a tarsomere of functional size. The second and third tarsomeres of all legs bear platform-like sensillae (Fig. 9). Although they appear slightly concave, this may be an artifact as with the antennal sensillae. The terminal claws are all double and small. The unhooked aedeagus is shallowly sinuate and acicular. It is folded forward atop the abdomen and covered apically when not extended (Fig. 11). On the ventral surface of the abdomen is a sagittal groove and the sternites are buckled to form pockets in which there are additional microtrichia (Fig. 12).

The female has been described and illustrated by Johnson (1973) but the triungulin is as yet unknown. Carvalho (1956, 1961) illustrates both for the genus in his works on Angolan strepsipterans as do Esaki and Miyamoto (1958) for *T. macroscyti* from Japan.

Life History

The host of *T. mexicana* in Georgia was determined as *Pangeus bilineata* (Hemiptera:Cydnidae) by Johnson (1973). However, dissection of over 50 *Pangeus* taken at the same time as Oklahoma specimens of *T. mexicana* revealed no evidence of parasitism. Cynids are used as hosts by foreign species of *Triozocera* (Carvalho 1956; Esaki and Miyamoto 1958). Females, which remain endoparasitic, exsert the cephalothorax through the membrane between the second and third abdominal tergites (Johnson 1973). Males emerge from their hosts and fly about seeking the females in their hosts.

Since male strepsipterans rarely live for more than 1 day, periods of collections correspond to periods of emergence. In Norman, Oklahoma, males have been taken between May and September with the greatest numbers obtained between the last week of July and the third week of August (Table I). Meadows (1967) collected the greatest numbers in Florida during July. In Louisiana, Khalaf (1968) records collections from April through mid November with a peak in July and August. Khalaf (1969) also has taken *T. mexicana* in Mississippi from April to September. Parasitized cydnids have been found by Johnson (1973) in May and August. *T. macroscyti* males occur from May to June in Japan (Esaki and Miyamoto 1958). The attraction of males to light is well documented (Pierce 1911; Carvalho 1956; Fox and Fox 1964; Meadows 1967; Maldonado and Navarro 1967; Khalaf 1968, 1969; Johnson and Sperka 1972; Johnson 1973). Thus, most collections have been made with light traps, usually incidental to some other survey. Riek (1970) feels that this attraction to lights is evidence that *Triozocera* males either emerge in the late afternoon or have an adult life span of more than 1 day. However, nocturnal activity plus an attraction to lights may well be related to cydnids being the host and their attraction to lights.

The sudden appearance and increase of the Oklahoma specimens (1975-2, 1976-160, 1977-377) is rather puzzling. All light trap collections between April, 1975 and November, 1977 were examined by me, so I think that almost all specimens collected were separated from the other insects. *T. mexicana* was apparently not taken in the previous 4 years of light trapping. Numbers of *Pangeus* taken in the traps showed no corresponding increase and most of the traps were in the same locations from 1975 to 1977. Furthermore, no specimens of this strepsipteran were found in the entomological collections of The University of Oklahoma or Oklahoma State University.

The distribution of *T. mexicana* is presently the southeastern United States west to Oklahoma and south to Mexico, Cuba and Puerto Rico, coinciding with the distribution of the only known host, *Pangeus bilineata* (Johnson 1973). A single additional specimen is recorded from the Philippine Islands (Carvalho 1956) but it may have been identified as *T. mexicana* when the genus was monotypic. The distribution of the various other species of *Triozocera* is as follows: *T. africana* Carvalho, Angola; *T. dundoana* Carvalho, Angola; *T. gigantea* Carvalho, Angola; *T. macroscyti* Esaki and Miyamota, Japan; *T. maxi* Fox and Fox, Liberia; *T. paulistana* Kogan, Brazil; *T.* spp. (six undescribed species), Australia.

Table I. Monthly distribution of *Triozocera mexicana* males collected in Oklahoma between 1975 and 1977.

Days	May	Jun	Jul	Aug	Sep
1-7	1	2	0	85	2
8-14	0	1	0	95	0
15-21	5	0	0	57	0
22-31	0	0	258	26	0

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